

C4205 Log Data Report

Borehole Information:

Borehole: C4205		Site: 216-U-1 and U-2 Cribs			
Coordinates (WA State Plane)		GWL: (ft)¹: Dry		GWL Date: 03/10/2004	
North	East	Drill Date	TOC² Elevation	Total Depth (ft)	Type
Not Available	Not Available	March 2004	Not Available	50	Push Hole

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Threaded steel	+0.5	7	6 1/16	15/32	+0.5	50

Borehole Notes:

Zero reference is the ground surface. The logging engineer used a caliper to determine the outside casing diameter. The caliper and casing stickup were both measured using a steel tape. Inside casing diameter was measured with a steel tape. All measurements were rounded to the nearest 1/16 in.

Logging Equipment Information:

Logging System:	Gamma 1G	Type:	SGLS (35%) 34TP10967A
Calibration Date:	01/2004	Calibration Reference:	GJO-2004-597-TAC
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3 / Repeat	4	
Date	03/10/04	03/10/04	03/11/04	03/11/04	
Logging Engineer	Spatz	Spatz	Spatz	Spatz	
Start Depth (ft)	48.85	48.5	44.5	7.5	
Finish Depth (ft)	48.85	6.5	39.5	0.5	
Count Time (sec)	200	200	200	200	
Live/Real	R	R	R	R	
Shield (Y/N)	N	N	N	N	
MSA Interval (ft)	N/A ³	1.0	1.0	1.0	
ft/min	N/A	N/A	N/A	N/A	
Pre-Verification	AG043CAB	AG043CAB	AG044CAB	AG044CAB	
Start File	AG043000	AG043001	AG045000	AG045006	
Finish File	AG043000	AG043043	AG045005	AG045013	
Post-Verification	AG043CAA	AG043CAA	AG046CAA	AG046CAA	
Depth Return	N/A	0	N/A	0	

Log Run	1	2	3 / Repeat	4	
Error (in.)					
Comments	Sonde tip is just touching bottom of borehole.	No fine-gain adjustment.	Repeat section.	No fine-gain adjustment.	

Logging Operation Notes:

Zero reference was ground surface. Logging was performed with a centralizer installed on the sonde. Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT (^{40}K , ^{238}U , and ^{232}Th) verifier with serial number 118.

Analysis Notes:

Analyst:	Sobczyk	Date:	3/17/04	Reference:	GJO-HGLP 1.6.3, Rev. 0
-----------------	---------	--------------	---------	-------------------	------------------------

SGLS pre-run and post-run verification spectra were collected at the beginning and end of the day. All of the verification spectra were within the acceptance criteria. The peak counts per second (cps) at the 609-keV, 1461-keV, and 2615-keV photopeaks on the post-run verification spectra as compared to the pre-run verification spectra for each day were between 0.9 percent lower and 2.8 percent higher at the end of the day. Examinations of spectra indicate that the detector functioned normally during logging, and the spectra are accepted.

Log spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Post-run verification spectra were used to determine the energy and resolution calibration for processing the data using APTEC SUPERVISOR. Concentrations were calculated in EXCEL (source file: G1GJan04.xls). Zero reference was the ground surface. Based on the field measurements, the casing configuration was assumed as one string of 6-in. casing with a thickness of 15/32 in. to 48.85 ft (total logging depth). Dead time and water corrections were not required.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (^{40}K , ^{238}U , and ^{232}Th), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation. The ^{214}Bi peak at 1764 keV was used to determine the naturally occurring ^{238}U concentrations on the combination plot rather than the ^{214}Bi peak at 609 keV because it exhibited slightly higher net counts per second.

Results and Interpretations:

^{137}Cs and ^{238}U were the man-made radionuclides detected in this borehole. ^{137}Cs was detected in the interval between 1.5 and 9.5 ft with concentrations ranging from 0.3 to 43 pCi/g, which was measured at 2.5 ft. ^{137}Cs was also detected at 39.5 ft on the repeat log run at a concentration near the MDL (0.2 pCi/g). Examination of the gamma energy spectrum indicates that the occurrence of ^{137}Cs at 39.5 ft is probably a statistical fluke, since a well-defined 662-keV photopeak is not evident. ^{238}U , based on the 1001-keV photopeak, was detected in the interval between 41.5 and 42.5 ft with concentrations ranging from 19 to 32 pCi/g. The maximum concentration was measured at 42.5 ft. The MDL for processed ^{238}U is approximately 15 pCi/g.

The plots of the repeat logs demonstrate reasonable repeatability of the SGLS data for the natural radionuclides at energy levels of 609, 1461, 1764, and 2614 keV and for ^{238}U at 1001 keV.

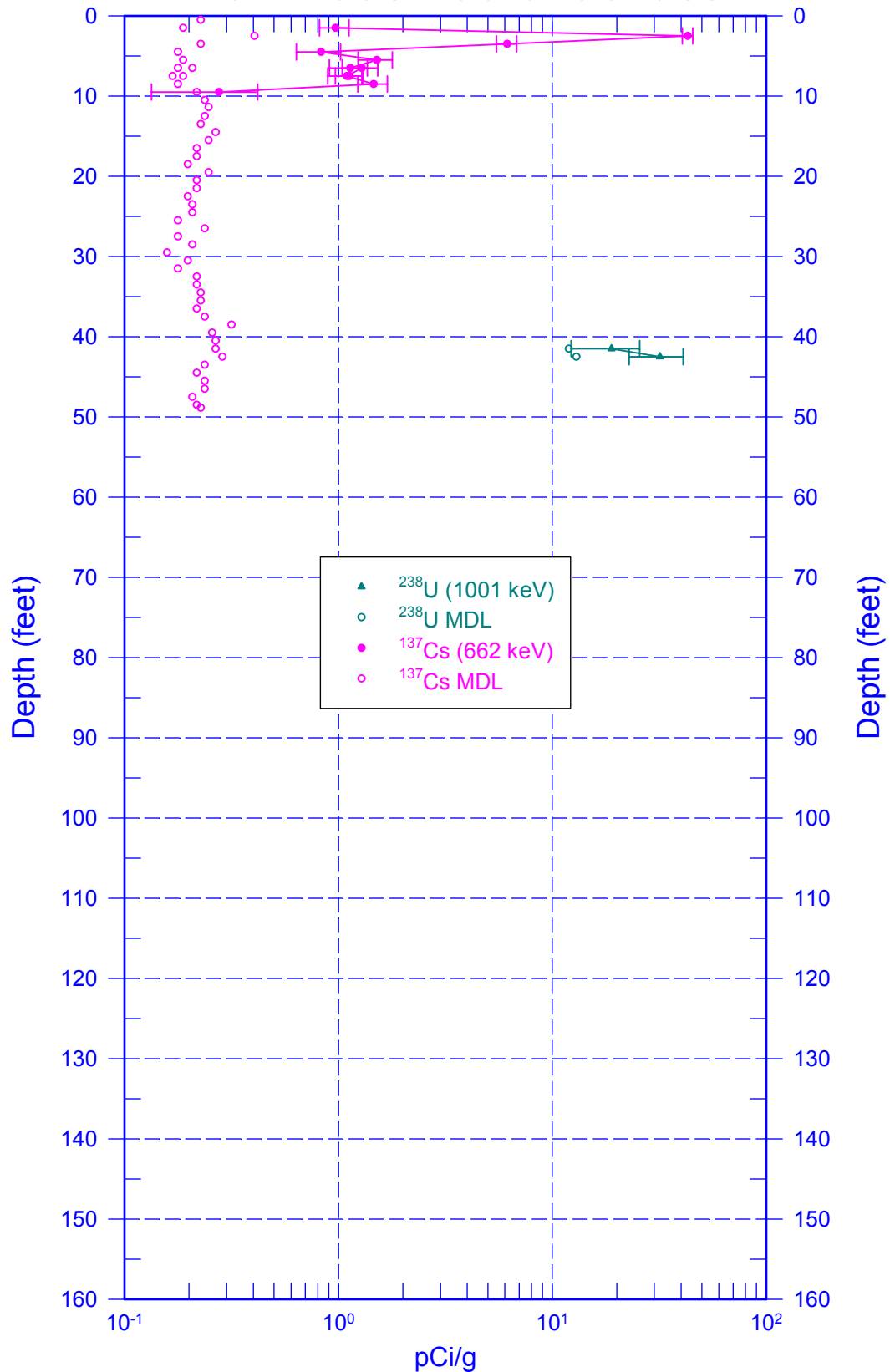
¹ GWL – groundwater level

² TOC – top of casing

³ N/A – not applicable

C4205

Man-Made Radionuclides

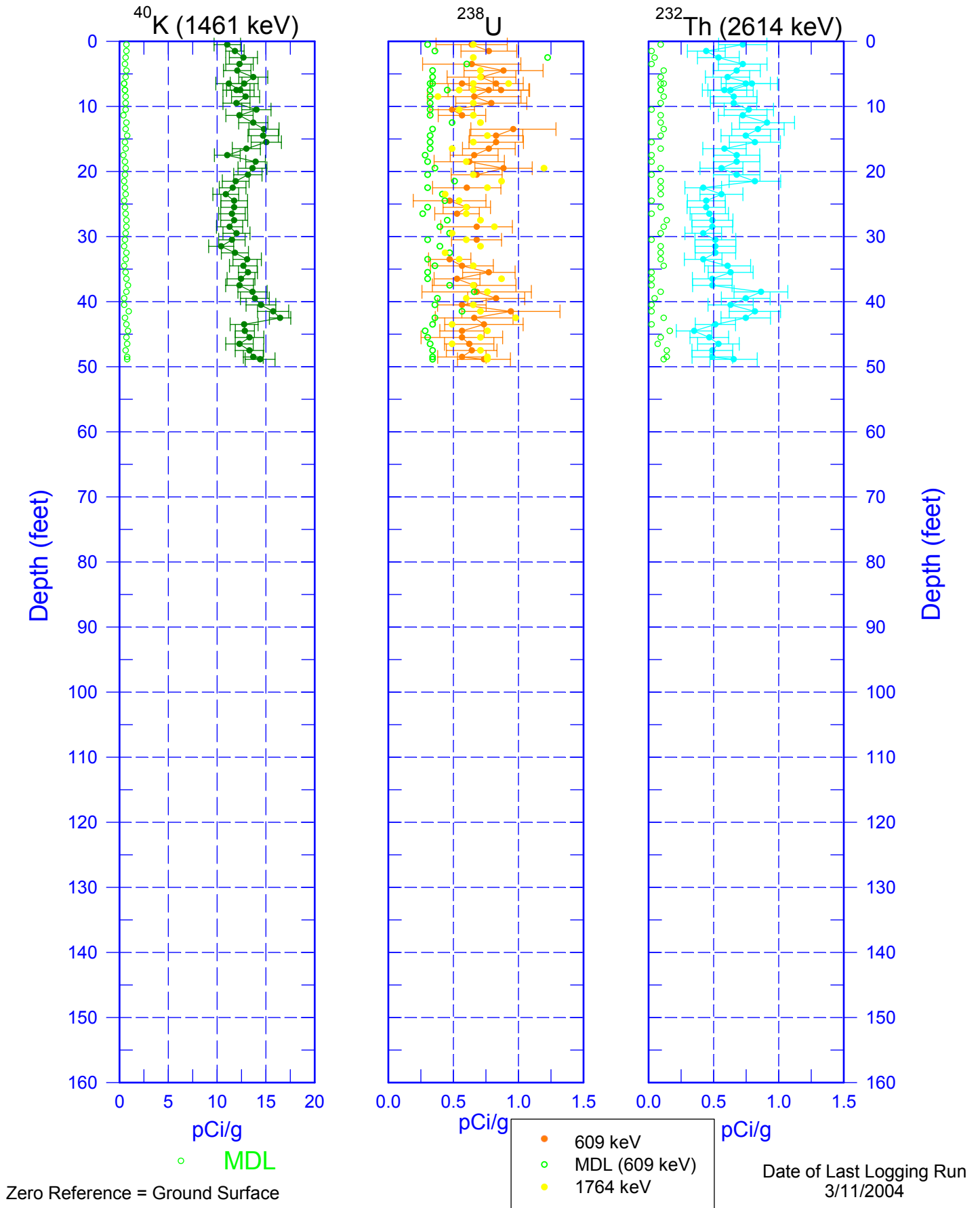


Zero Reference = Ground Surface

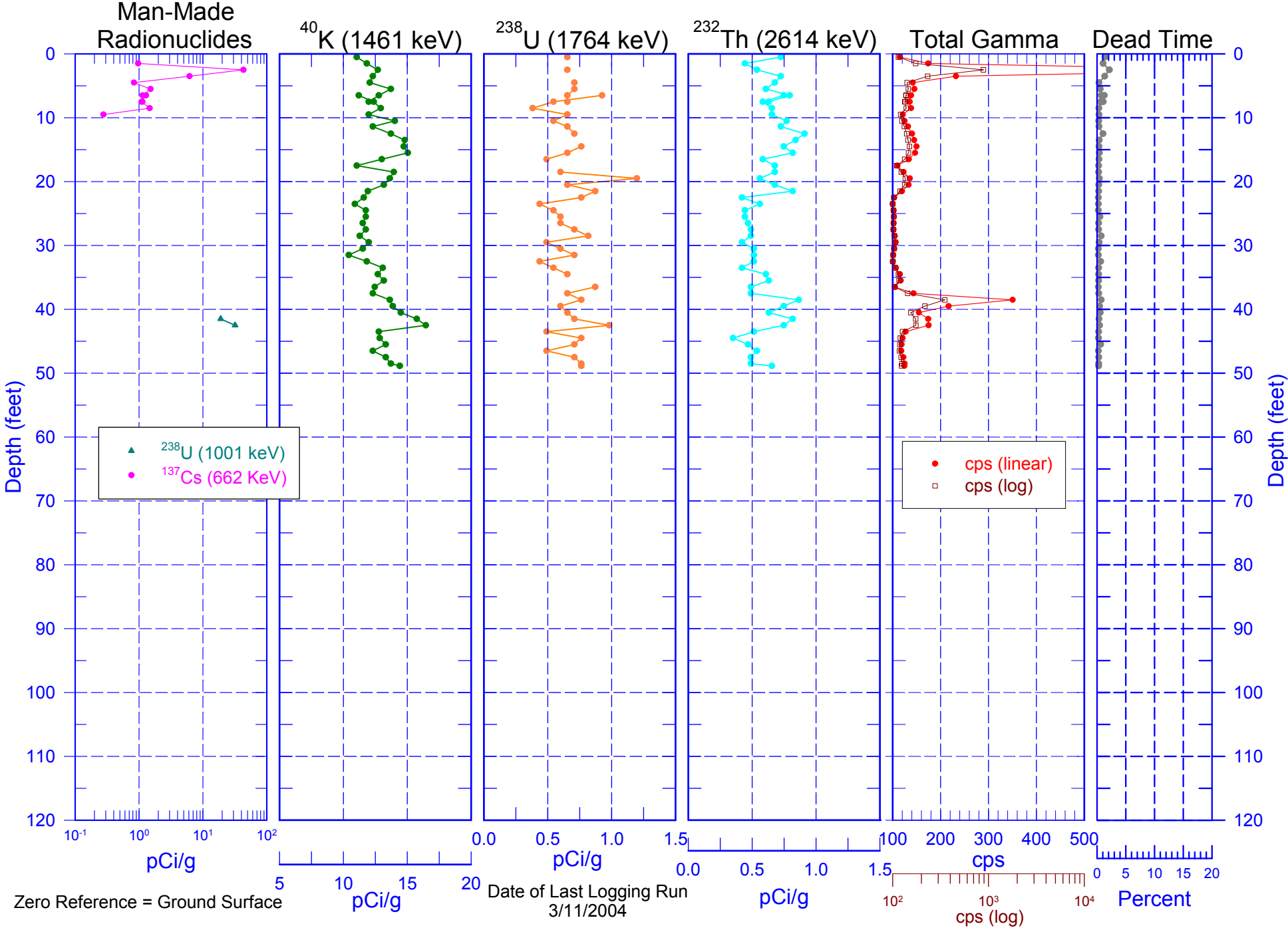
Date of Last Logging Run
3/11/2004

C4205

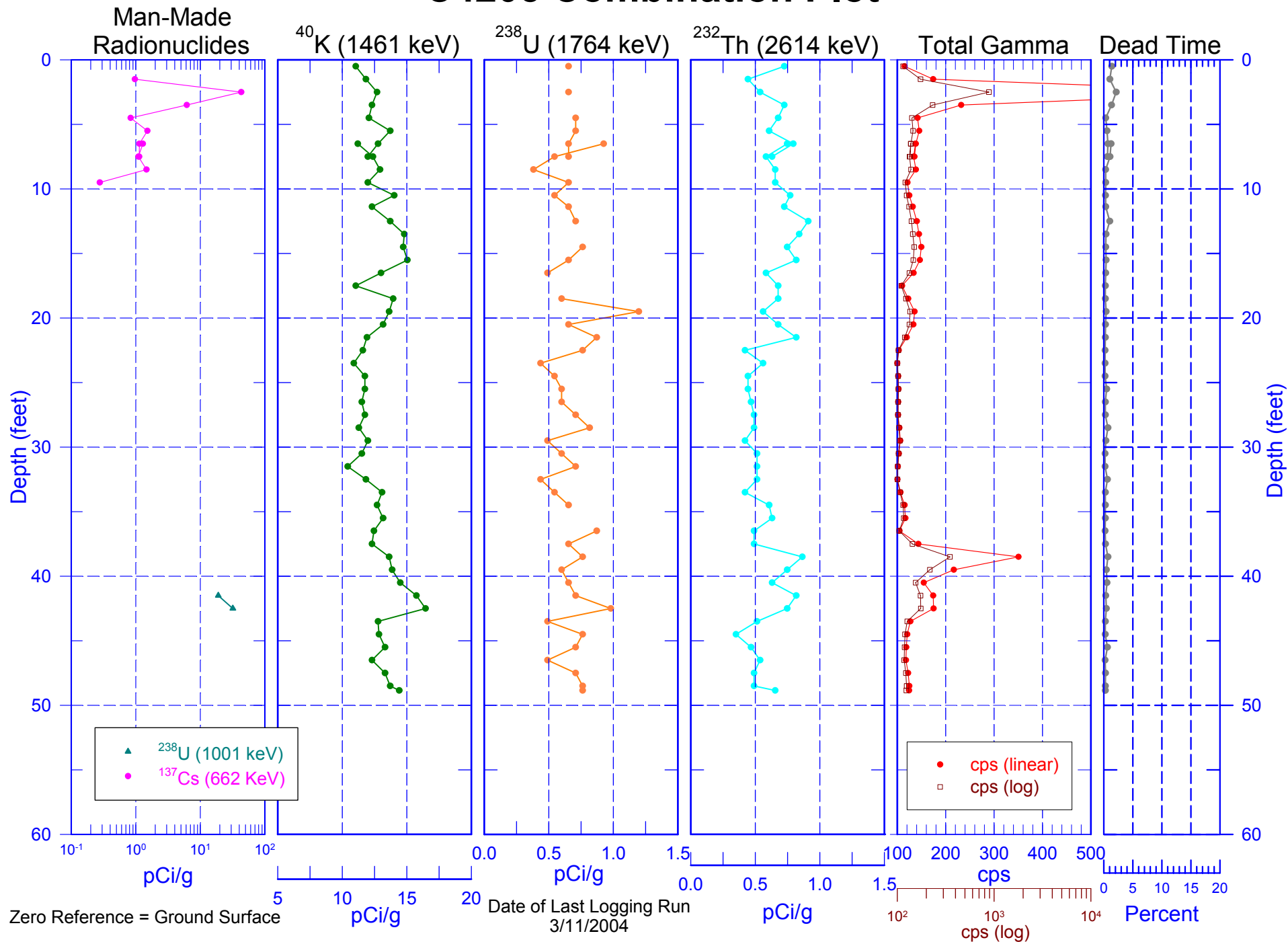
Natural Gamma Logs



C4205 Combination Plot

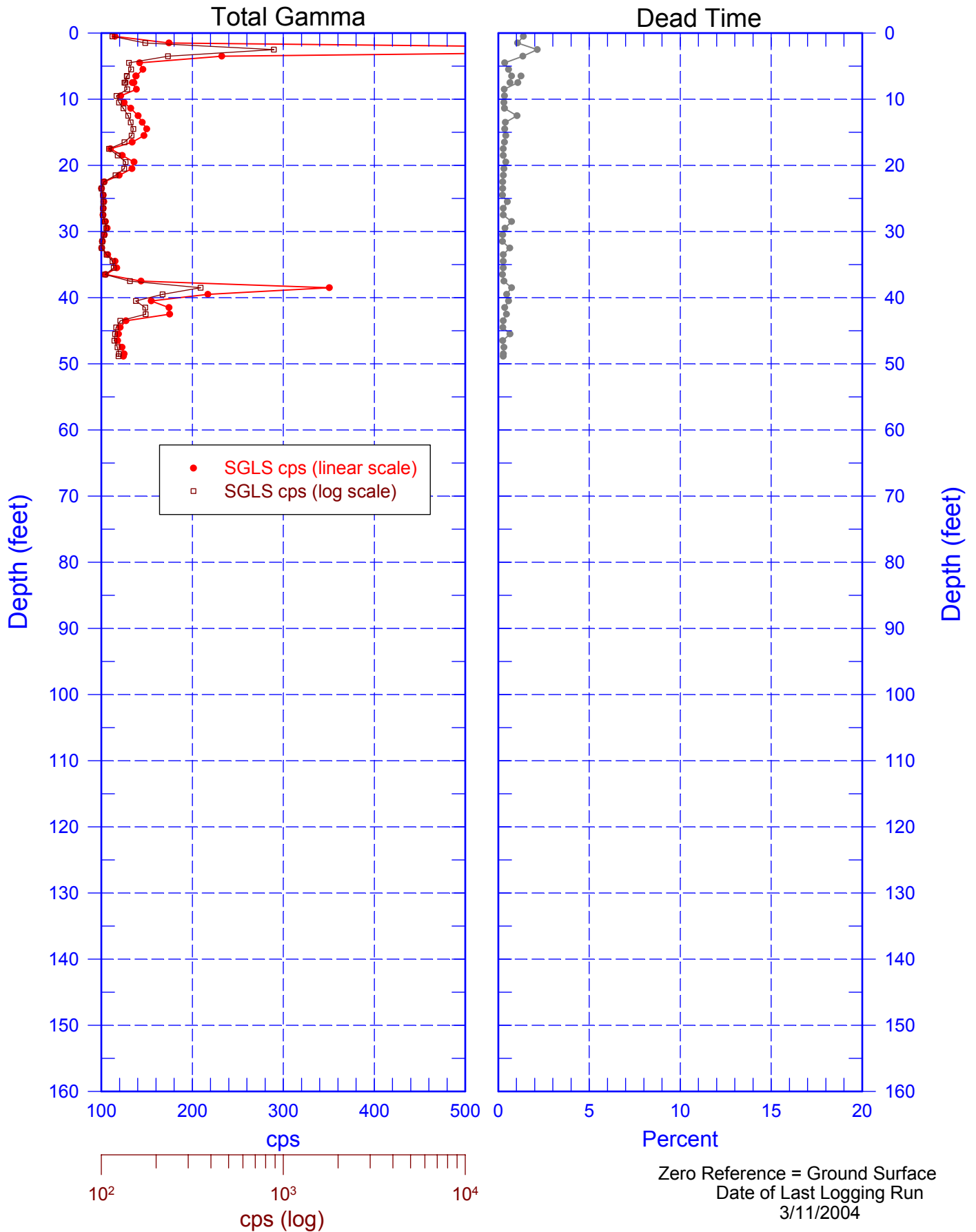


C4205 Combination Plot



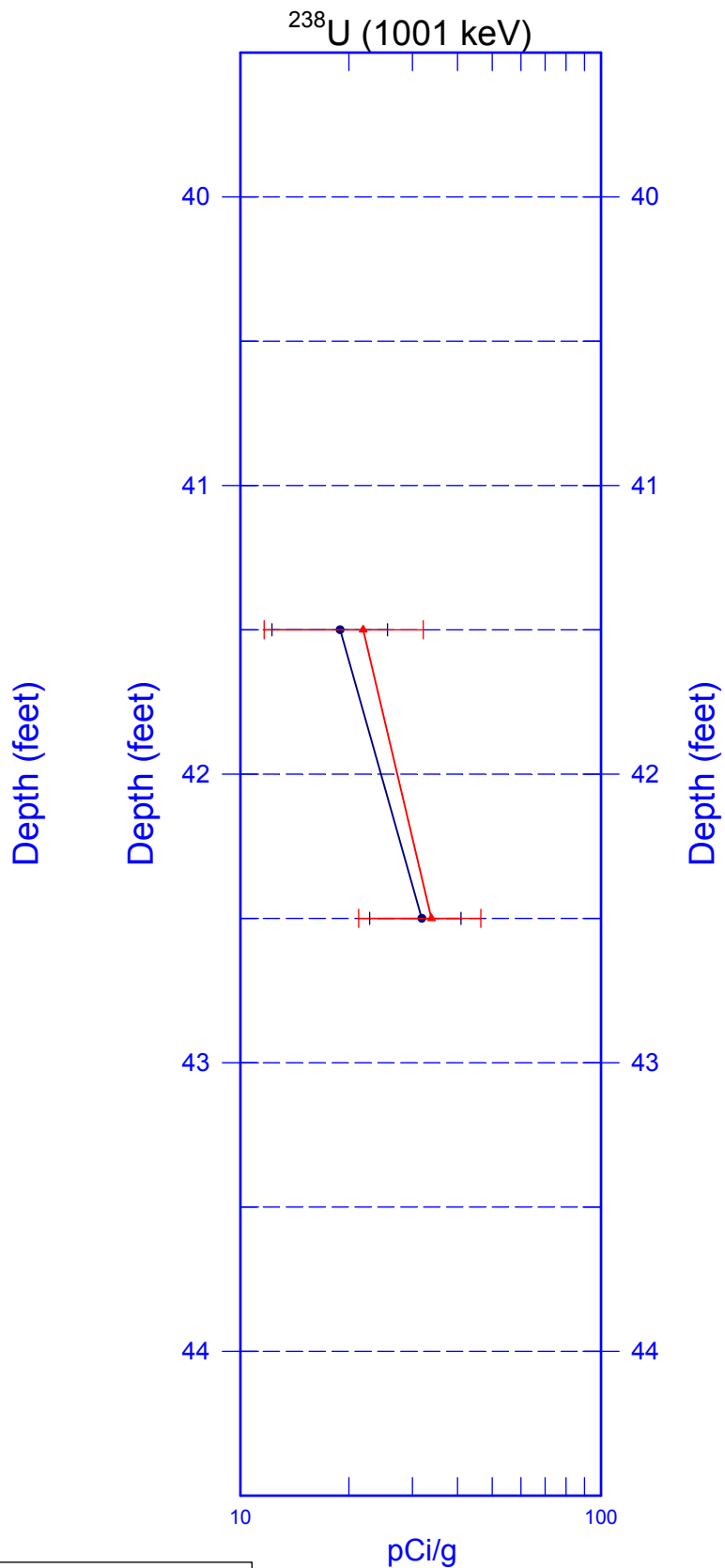
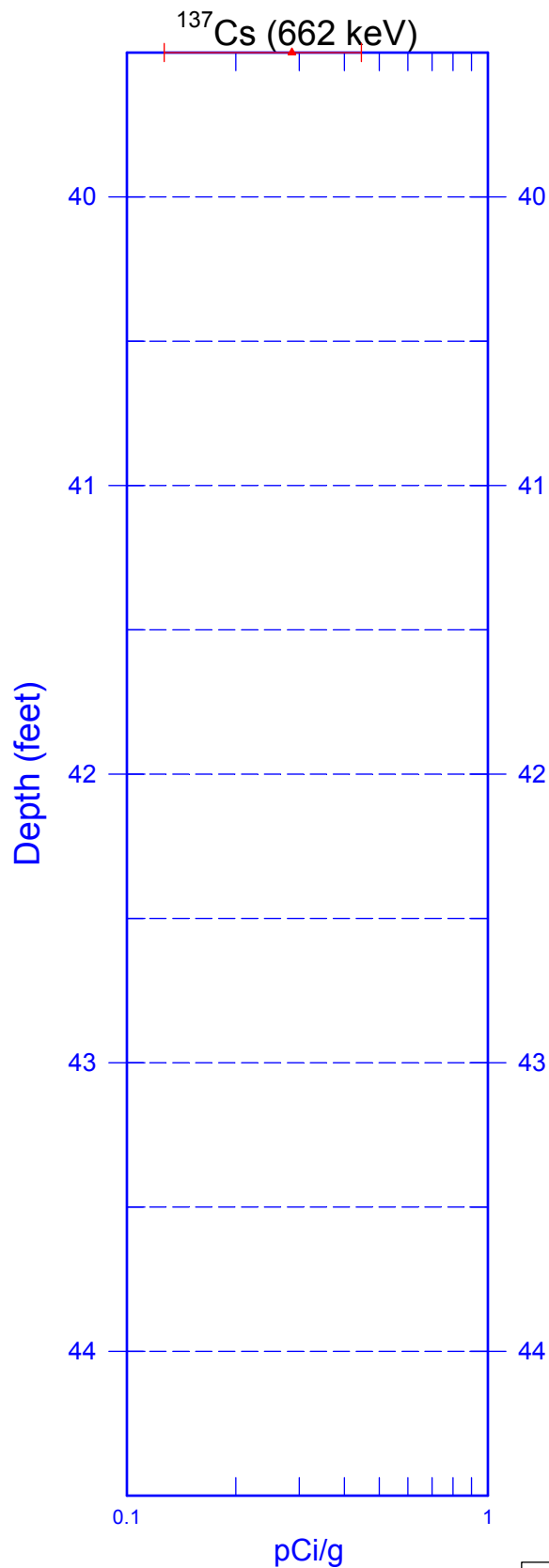
C4205

Total Gamma & Dead Time



C4205

Rerun of Man-Made Radionuclides



—●— Original Log Run
—▲— Repeat Log Run

C4205

Rerun of Natural Gamma Logs (44.5 to 39.5 ft)

